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Mandelbaum

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[54] **STORAGE BUILDING STRUCTURE AND A CAB FOR MOVEMENT THEREIN**

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June 28, 1972 United Kingdom..... 30298/72

[52] **U.S. Cl.** ..... **52/30;** 214/16.4 A; 312/283

[51] **Int. Cl.**[2] **B66B 09/00;** E04H 06/06

[58] **Field of Search**..... 214/16.4 A, 16.1 F, 16.1 B, 214/16.4 B; 52/36, 236, 30; 211/13, 134; 312/245, 283

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Assistant Examiner—R. Johnson
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[57] **ABSTRACT**

A high capacity storage building has solid partitions extending several stories in height between ground and roof levels and dividing the interior of the building into individual storage compartments. Pairs of partitions extend from one side of the building to an opposite side thereof in neighboring and substantially parallel, spaced, relation to define between them a storage compartment with a wide aisle and an intermediate corridor. Rods are imbedded in each partition substantially over its entire area in regularly spaced relation both in vertical and horizontal alignments, the rods on each partition extending conterminously into the proximal portion of the aisle to the edges of the corridor. Shelving is supported on the horizontally aligned rods for the storage of goods, and standards interconnect some of the vertically aligned rods, the standards being anchored at the ground and roof levels to buttress each partition. Roofing extends over neighboring partitions, and a cab is movable both horizontally and vertically in each corridor to provide access to the shelving on each partition.

6 Claims, 7 Drawing Figures

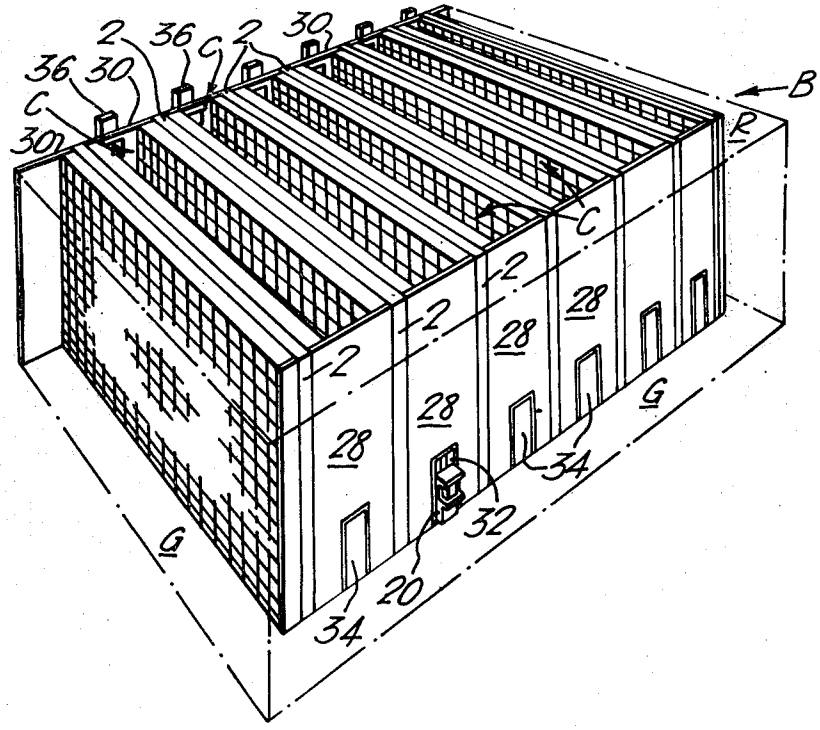


FIG.1.

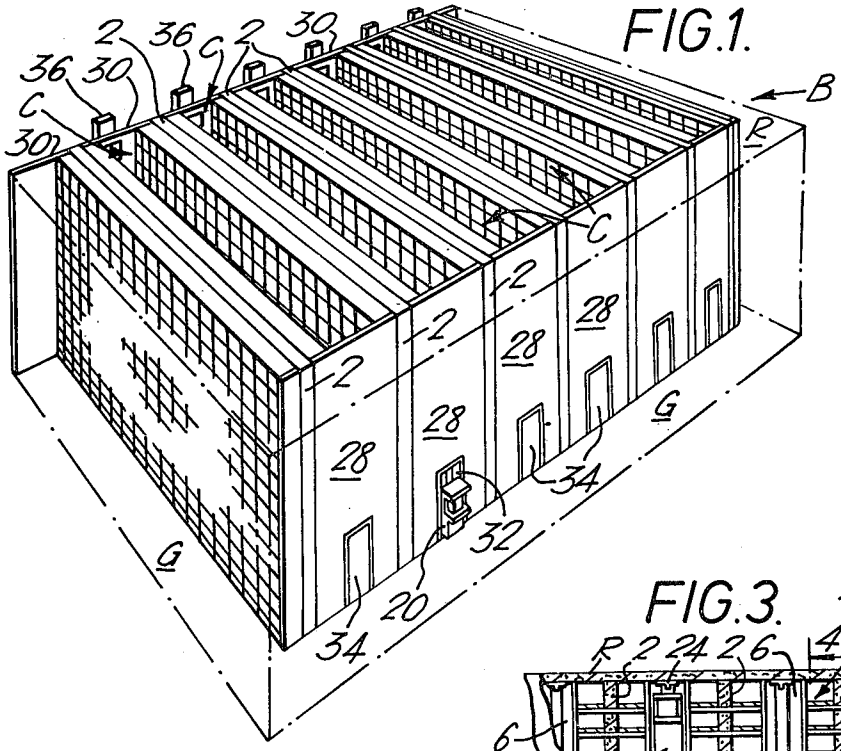


FIG.3.

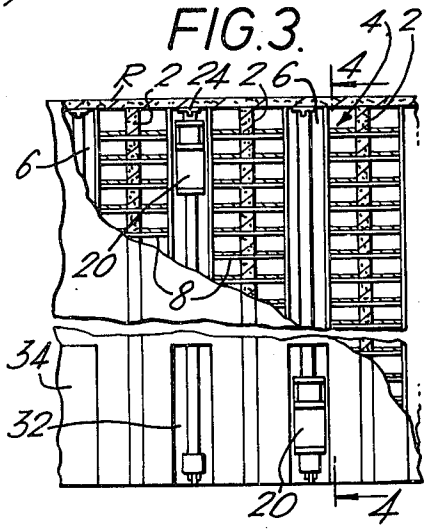


FIG.2.

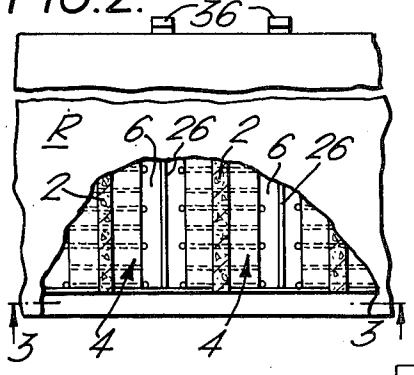
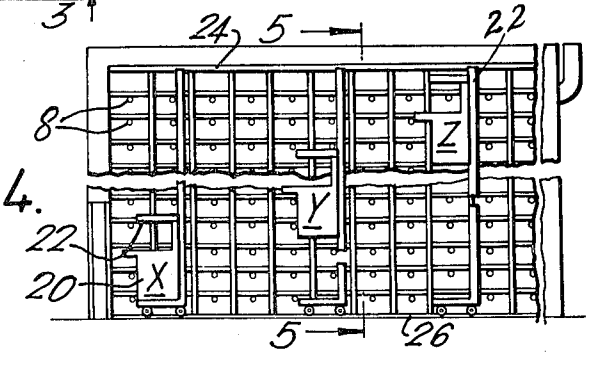


FIG.4.



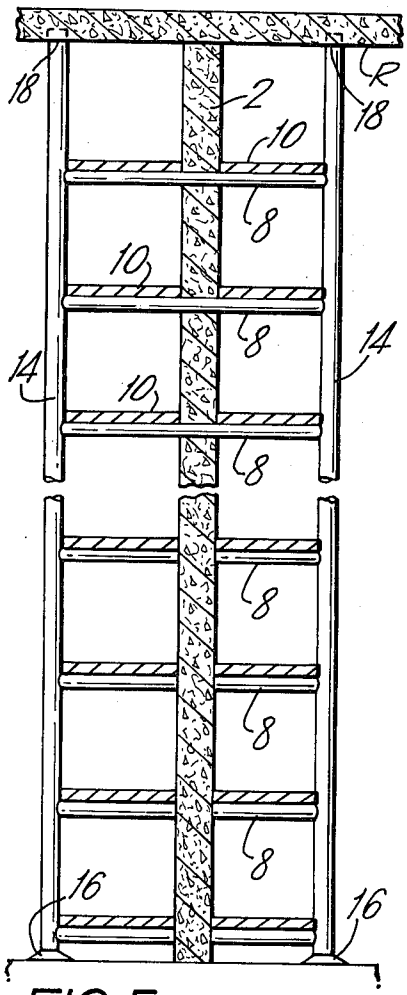


FIG.5.

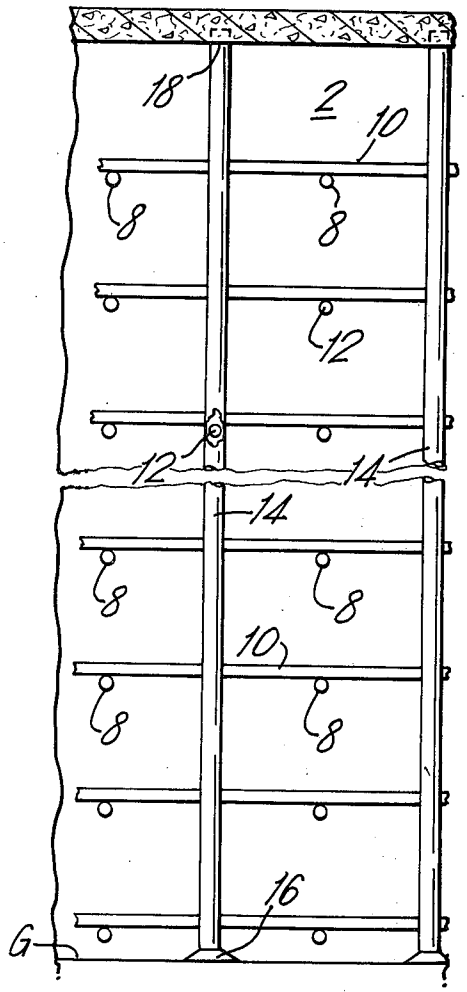


FIG.6.

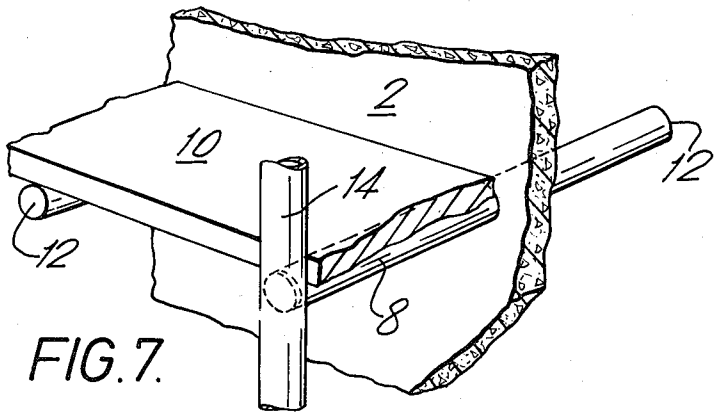


FIG.7.

STORAGE BUILDING STRUCTURE AND A CAB FOR MOVEMENT THEREIN

This invention refers broadly to high capacity storage buildings and, in particular, to the interior construction and arrangement thereof.

A storage building as herein visualized usually covers many thousands of square feet in area and rises to a height of several stories. The interior of the building is not obstructed or subdivided by floors and almost the whole thereof — apart from access lanes — is filled from ground to roof with racks of storage bins or shelving separated by aisles or corridors extending across one dimension of the building, from one of its sides to the other.

Heretofore, such shelving has mainly been provided by metal storage racks and access thereto has been had by means of an elevator movable laterally as well as vertically in the corridors or aisles between the racks.

The embodiment of the invention selected and described later on herein visualizes a high capacity storage building as aforesaid, whose interior is divided substantially entirely into individual storage compartments by solid, fireproof, partitions extending in spaced, parallel relation from one side of the building to the opposite side thereof between ground and roof levels; each pair of neighbouring partitions being separated by a relatively wide aisle with an intermediate central corridor accommodating an elevator as aforesaid. Each said pair of partitions is also roofed over and, at their ends, said partitions are joined by end-walls co-operating with the partitions and the roofing to form a substantially enclosed compartment; it being understood, of course, that access to each compartment is provided by an opening formed in at least one of its end-walls; said opening being equipped with a closure by which the compartment may be rendered completely enclosed.

To serve the storage requirements of the building, the invention visualizes that each said solid partition will be constructed of a structural, fireproof material, such as concrete which is capable of being poured, and will have rods embedded therein over substantially its entire area so as to project from each side of the partition in horizontally and vertically aligned rows; said rods projecting from each said partition conterminously into the proximal portion of the said aisle to the edges of the corridor between the partitions; the horizontally aligned rods providing support for shelving. At their ends, some, at least, of the vertically aligned rods projecting from each partition are interconnected by standards anchored at the said ground and roof levels thereby buttressing each partition on both sides thereof and supporting the shelving at the same time. It will be understood that, by these means, the solid partitions will be adequately supported not only against their own weight, but also against the weight of the goods which may be loaded thereon.

Since the partitions and, of course, the shelving extend several stories in height as aforesaid, it will be appreciated that elevator means as aforesaid is required for rendering the shelving accessible for loading and unloading of goods. Accordingly, the invention further visualizes each said corridor as being formed in the proportions enabling it to accommodate a travelling "order picker" of a fairly well known construction which includes an elevator cab mounted for vertical movement on a vertical post which is horizontally movable to and fro along said corridor on aligned upper and lower guide facilities disposed at roof and ground levels of the corridor for loading and unloading of said shelves.

In its preferred form, the invention further visualizes that each of said compartments will be equipped with a ventilator for exhausting stale air therefrom and so procuring the entry of fresh air through the access opening thereof, for example.

Briefly stated, the principal objects of the invention, accordingly, include the provision of a high capacity storage building containing shelving for the storage of goods; said shelving being supported on bracket-like elements projecting cantilever fashion from solid, fireproof, partitions extending across one dimension of the storage building from one of its sides to the other, and from ground to roof levels.

Other important objects of the invention include the provision of means for buttressing said partitions; the provision of means co-operating with said partitions to form a plurality of individually enclosed and self-contained storage compartments, and the provision of ventilation facilities for each compartment for assisting, amongst other things, in the control of fires breaking out within the said compartments. In addition, the invention seeks also to provide an improved method of constructing a building with storage facilities as aforesaid.

The various objects of the invention are achieved, essentially, by providing a high capacity storage building as aforesaid, whose interior is divided substantially entirely, into individual storage compartments by solid, fireproof partitions extending in spaced parallel relation from one side of the building to the opposite side thereof between ground and roof levels and across one dimension thereof; each pair of neighboring partitions defining between them, a wide aisle with an intermediate central corridor for accommodating a travelling elevator as described; each said partition having rods embedded therein substantially over its entire area which project therefrom in regularly spaced relation and are aligned both in vertical and horizontal rows; the respective rods on each of said pair of partitions projecting therefrom conterminously into the proximal portion of the said aisle to the edges of said corridor; shelving being supported on horizontally aligned rods for the storage of goods; standards interconnecting some of said vertically aligned rods; being anchored at said ground and roof levels for buttressing each said partition; roofing over said neighbouring partitions and end-walls joining said partitions at each end of said aisle and with a closable access opening in, at least, one end-wall of each compartment.

Other objects of this invention more or less broad than the foregoing will be apparent from the hereinafter following description of the elements, parts and principles of the invention given herein solely by way of example and with reference to the accompanying drawings wherein like reference numerals refer to like parts and wherein —

FIG. 1 is a perspective view of a building shown in skeleton having substantially its entire interior divided into compartments by partitions;

FIG. 2 is a top plan view of a portion of the building of FIG. 1 showing the constituent parts of the compartments;

FIG. 3 is a front elevational view of the compartments taken along line 3—3 of FIG. 2 with sections removed showing the elevator means in the corridors;

FIG. 4 is a side elevational view through a compartment taken along line 4—4 of FIG. 3 and showing various positions of the elevator means movable therein;

FIG. 5 is an enlarged elevational end view of a partition taken along line 5—5 of FIG. 4 and showing rods embedded therein with shelving and standards;

FIG. 6 is a side elevational view of FIG. 5 showing standards interconnecting some of the vertically aligned, shelf supporting rods, and

FIG. 7 is an enlarged and detailed perspective view of a standard engaged with a rod end projecting from a partition.

In the preferred embodiment of the invention illustrated generally in FIG. 1 there is outlined a high-capacity storage building B several stories in height whose interior is substantially entirely divided into a plurality of individual storage compartments C by neighbouring pairs of solid partitions 2 extending vertically form the ground G to the roof R of the building B as shown in FIG. 3; said partitions 2 extending, in this embodiment, in regularly spaced, parallel, relation across one dimension of building B from one of its sides to the opposite side. Each said storage compartment C, bounded by said solid partitions 2—2, includes a wide aisle 4 — i.e. the distance between confronting partitions — with a centrally located corridor 6 for the elevator mechanism to be described as best shown in FIG. 2 wherein said corridor 6 is seen to bisect the aisle 4.

Each said solid partition 2 is made of dense, fireproof and pourable material such as concrete, for example, and includes rods 8 imbedded therein substantially over its entire area which project from both sides thereof in regularly spaced relation both in vertical and horizontal alignments in the manner of rows as shown in FIGS. 4 and 6; said rods 8 projecting cantilever fashion from both surfaces of said partition 2 as in FIGS. 3, 5 and 7 on opposite sides and extending conterminously into the proximal portion of adjacent compartment aisles 4—4 to an edge of each respective corridor 6. Supported on the horizontally aligned rods 8 is shelving 10 for the storage of goods. The conterminous ends 12 of some of the vertically aligned rods 8 are interconnected by standards 14; said standards 14 being anchored at ground and roof levels as at 16 and 18, respectively, thereby buttressing said partition 2 on each side thereof. Thus, it will be understood that said solid partitions 2, although several stories in height and relatively thin, are reinforced not only against their own intrinsic weight and leverage but also against the weight of the goods carried on the shelving 10. In addition, it is visualized that in certain circumstances a said partition 2 may be constructed in situ. That is to say, said concrete partition 2 may be made by pouring concrete into a form on the ground containing pre-positioned rods 8 and, of course, sufficient reinforcing materials therein. Thereafter, each partition 2 may be raised by a crane, for example, to vertical position to bound the compartments aforesaid. Alternately, each partition may be pre-formed sectionally; the sections being thereafter assembled to form the partition.

As regards loading and unloading of shelving 10, the invention further visualizes that the corridors 6 aforesaid will be formed and proportioned to enable passage of an order picker elevator to and fro therethrough between the shelving 10—10 on each pair of neighbouring partitions 2—2. Essentially, said order picker is comprised of a cab 20 movably mounted on a vertical post 22 of appropriate height, in the manner of a vertically movable carriage, for example; the top and bottom ends of post 22 being engaged with upper and lower guide facilities such as rails 24 and 26 shown at roof and ground levels of the building respectively; said post 22 being horizontally or laterally movable along the corridor 6 on said rails 24 and 26. Obviously, said order picker is selectively controllable either remotely or directly from the interior of the cab 20. Thus, from FIG. 4 it will be observed that said cab 20 is capable of being moved both horizontally and vertically between the first location X, for example, at its lowermost position at ground level, a second location Y intermediate ground and roof levels and a third location Z near the roof as shown in this view. With such known order pickers, an operator travels in the cab which is moved horizontally and vertically to provide the operator with access to the shelves, thereby enabling the operator to place articles thereon or remove them therefrom. Since such order pickers are known, it is not believed necessary to describe them further, since the man skilled in the art is aware of the manner in which such order pickers are constructed, and the inventive advance in this application is not concerned with the order picker per se but with the construction of the partitions and shelving of the building.

Referring once again to FIG. 1 it will be observed that each said aisle 4, between a pair of said partitions 2, is closed at its ends by end-walls 28 and 30 joining the ends of said partitions 2—2. By this means, it will be understood that each said compartment C can be relatively completely enclosed and isolated from the other compartments; the compartment C being also roofed as at R.

It will be appreciated, of course, that each compartment C is provided with an opening 32 in at least one of its end-walls affording access to the compartment. Each said opening 32 may be dimensioned and proportioned to enable a said cab 20 to pass therethrough and in addition said opening 32 is further provided with a closure 34 — e.g. a door — for completing total enclosure of the compartment C when and if required.

In the preferred form of the invention, the said compartments C are also equipped with individual ventilators 36 which are, preferably, of the exhaust variety capable of exhausting air from the respective compartments C.

The structure visualized by the invention and heretofore described for providing storage facilities in a storage building B is thought to provide many advantages over the prior art.

In the first place, the partitions herein visualized not only provide solid and substantial supports for the shelving 10, but they may also function as roof supports and, generally, as re-inforcing elements for building B.

In turn, said standards 14 not only function to provide outboard support for shelving 10 but also as flying buttresses for the respective partitions 2—2 reinforcing them and enabling reduction in thickness thereof, for example, in accordance with established engineering principles.

Also believed to be of major importance is the fact that each compartment C is capable of being converted into a self-contained enclosure which is believed to be

of great value in fire control. It is visualized, for example, that upon breakout of fire in a said compartment C, its closure **34** may be operated to seal the compartment completely which not only serves to confine the fire to that compartment alone but also to starve it of combustion-supporting oxygen thereby inducing rapid self-extinction of the fire.

Moreover and under certain circumstances, the continued operation of ventilators **36** during a fire will tend to exhaust the air from the fire-struck compartment C thereby further embarrassing the fire and still further hastening its extinction.

In still further addition to the foregoing, the ventilators **36** may be operated during a fire to draw fire extinguishing gases — e.g. nitrogen — into the compartments C.

Thus in the event of fire, it is not inconceivable that the control means visualized by the invention will afford definite and positive advantages over more conventional systems, such as a sprinkler system with the usual water damage which attends its use.

What I claim is:

1. A high capacity storage building comprising:

solid partitions within said building extending several stories in height between ground and roof levels and dividing the interior of said building into individual storage compartments, at least one pair of said partitions extending from one side of the building to an opposite side thereof being disposed in neighboring and substantially parallel, spaced, relation defining between then a storage compartment as aforesaid with a wide aisle and an intermediate corridor;

rods imbedded in each said partition substantially over its entire area in regularly spaced relation both in vertical and horizontal alignments, the rods on each said partition extending conterminously into the proximal portion of the said aisle to the edges of said corridor;

shelving supported on said horizontally aligned rods for the storage of goods;

standards interconnecting some of said vertically aligned rods, being anchored at the said ground and roof levels buttressing each said partition;

roofing over said neighboring partitions, a cab movable both horizontally and vertically in said corridor to provide access to said shelving on each said partition, and means for moving said cab both horizontally and vertically as aforesaid.

2. A high capacity storage building as defined in claim **1** and further including:

a third partition generally similar in all respects to each of the pair of partitions aforesaid and disposed in spaced, parallel relation to one of them and co-operating therewith to define a second storage compartment with an aisle, corridor, rods, shelving and buttressing all as contained and disposed in the first said compartment as aforesaid; each said pair of partitions constituting a compartment for the storage of goods on the said shelving.

3. A high capacity storage building as defined in claim **2** wherein:

each said partition is made of concrete.

4. A high capacity storage building as defined in claim **2** wherein:

each pair of neighboring partitions is joined at each end of the aisle by a wall; at least one said wall being provided with an opening providing access to the storage compartment between said partitions.

5. A high capacity storage building as defined in claim **4** wherein:

each said access opening includes a closure.

6. A high capacity storage building as defined in claim **5** wherein:

said solid partitions divide substantially the entire interior of said building into individual compartments as aforesaid; the roof and end walls of each pair of partitions rendering each said compartment relatively completely enclosed and isolated from other like compartments; each said compartment being provided with ventilators.

* * * * *